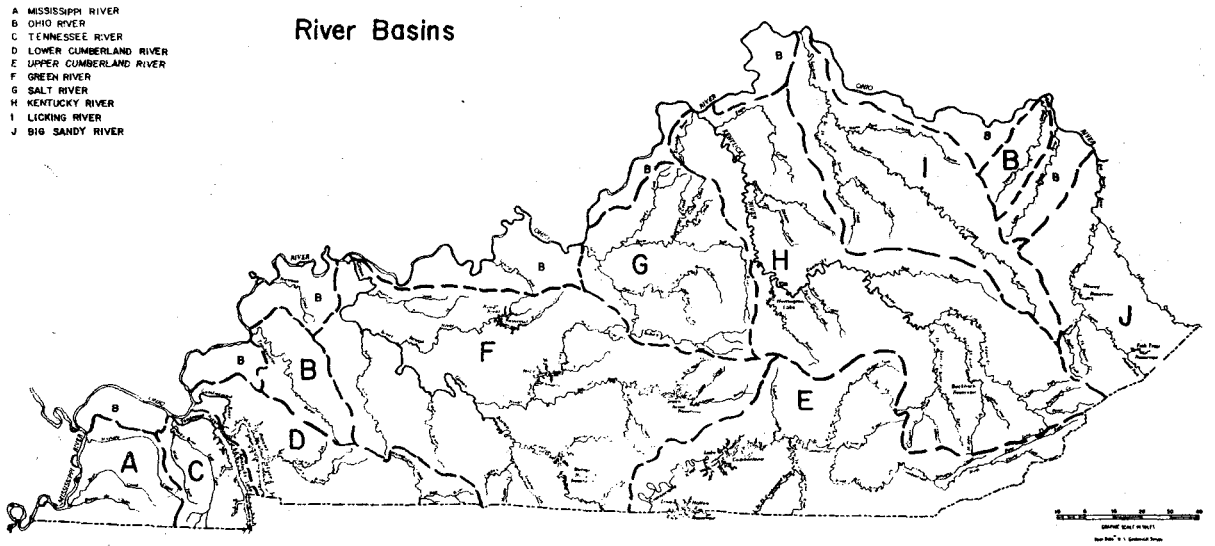
KENTUCKY
WATER QUALITY
REPORT TO CONGRESS



Department for Natural Resources and Environmental Protection
Division of Water (Quality)
Frankfort, Ky. 40601

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Contents

INTRODUCTION

This report is written to fulfill the requirement under PL 92-500, Section 305(b), to provide a report containing a description of the current water quality and the effects of water quality programs in Kentucky. The description is to include an indication of the extentent to which the water quality has, can and will meet the goals of this act under these programs. To this end, the Kentucky Division of Water Quality has assembled information on past and current water quality. The future water quality in Kentucky can only be predicted in general terms in anticipation of policies and decisions of local, state and federal agencies.

The information which has been compiled and is presented is an update of the 1975 "Kentucky Water Quality Report to Congress." This report consists of a re-compilation of water quality data for periods prior to January 1, 1975 and data collected during calendar year 1975. The water quality data used was collected and reported to "STORET" by the United States Geological Survey. The data was retrieved from "STORET" and summarized in charts and tables. The Kentucky Division of Water Quality data on trace elements and bacteriological analyses was also used. Information concerning point source discharges was updated from the continuing planning efforts under Section 303e. The status of municipal construction grants was updated. A new section on major lakes was added. The U. S. Army Corps of Engineers provided a summary of the projects within the three Districts in Kentucky. The Ohio River Valley Sanitation Commission prepared an assessment of the "Ohio River Main Stem" which is available for calender year 1975.

SUMMARY OF WATER QUALITY IN KENTUCKY

The quality of water in Kentucky is the result of the interactions of rain waters contacting the earth, flowing over the land, soaking into and passing through the soil, over minerals, dissolving minerals into the waters and the waters transporting materials to the streams. The materials with which water contacts on its way to a stream or lake will dictate what these waters contain once they reach a stream or lake. In-organic materials (soil constituents, calcium, sulfate, chloride, etc.) will make up the bulk of the dissolved solids and will determine a waters hardness, acidity/alkalinity and other charistics. Organic materials carried in the waters will effect to some degree the level of dissolved oxygen in the water through physical and biological processes in these waters.

As you read the different sections of this report, each written for a particular river basin, the charactistics of a river basin which have an effect on water quality will become evident. The size of a basin will determine how sensitive or insensitive to inflow and quality to change inflow and quality a river basin is. A small basin like the Salt River will react quickly to rains while a large impounded basin like Tennessee is relatively stable and slow to change.

The geology in a basin will effect the type of water produced. Within the Kentucky River Basin for example; Figure H-2 North Fork Kentucky River, (page 212) shows waters which have contacted disturbed earth in the Eastern Kentucky Coal Fields. This water is hard, high in dissolved solids, high in sulfate, high in acidity at times and high in chlorides. In contrast, the Red River, Pine Ridge in the same river basin (figure H-4, page 214) shows waters

which have had few dissolved solids added, are relatively soft, have normal alkalinity and are of generally high quality.

The hydrology of each river basin has been presented. The term hydrology is used here to mean a summary of the important aspects of the amount of water which has been discharged past a measuring location on a stream. The following Table-1 will give the relative amount which eight of the ten river basins discharge during an average year.

Table I

AVERAGE DISCHARGE FROM RIVER IN KENTUCKY

OHIO RIVER	262,000 cfs
TENNESSEE RIVER	64,000 cfs
CUMBERLAND RIVER	27,500 cfs
UPPER CUMBERLAND RIVER	9,100 cfs
GREEN RIVER	11,000 cfs
SALT RIVER	3,300 cfs*
KENTUCKY RIVER	7,200 cfs
LICKING RIVER	4,150 cfs
BIG SANDY	4,450 cfs

NOTE: These are the most downstream stations in each basin.

* Sum of the two main streams, Rolling Fork and Salt River.

The population within a river basin will have an effect on streams due to the location and concentration of organic loads imposed on these streams. The population within each basin is shown in Table-2.

Table 2

POPULATION IN KENTUCKY

	BASIN	POPULATION 1970 Census	DRAINAGE AREA KENTUCKY	POPULATION DENSITY NO./ SQ.MI.
A.	Mississippi	56,637	1,250	45.3
B.	Ohio	993,001	6,090	163.1 [1]
C	Tennessee	68,412	1,000	68.4
D.	Lower Cumberland	92,380	1,900	48.6
E.	Upper Cumberland	260,000	5,077	51.0
F.	Green	426,000	8,821	48.3
G.	Salt	507,233	2,932	173 [2]
H.	Kentucky	534,000	7,033	105 [2]
I.	Licking	211,000	3,700	57.0
J.	Big Sandy	112,000	2,285	49.5
		3,261,072	40,088	81.3

Propulation greater than 50,000

1 Louisville, Owensboro

2 Lexington

The point source loads on streams which are predicted to depress the dissolved oxygen below 5.0 mg/l as a result of the population distribution within each basin is shown in Table-3. This table shows the effect of all treated effluents on streams in Kentucky in relation to the predicted dissolved oxygen content during design flows. It is shown by this table that the municipalities in Kentucky contribute 35 percent, the industries contribute 7 percent, and that small discharges contribute 58 percent of the organic point source loads which may cause the dissolved oxygen to be less than 5.0 mg/l in Kentucky streams.

Table 3

POINT SOURCE LOADS* IN KENTUCKY STREAMS

BASIN	STREAM MILES STUDIED	DISSOLVED OXYGEN PREDICTED LESS THAN 5.0 MG/L TOTAL MILES	MUNICIPAL	INDUSTRIAL	OTHER
A. Mississippi	275	84	13	26	45
B. Ohio	431	85	36	8	41
C. Tennessee	248	59	15	14	30
D. Lower Cumberland	360	62	40	0	22
E. Upper Cumberland	752	167	25	0	151
F. Green	1,670	214	173	6.8	34.5
G. Salt	596	160	61	8	91
H. Kentucky	868	145	119	0	26
I. Licking	1,000	384	89	46	249
J. Big Sandy	560	250	10	5	235
	6,760	1,609	570	114	925

* 1975 Wasteload Allocation from 303e River Basin plans.

There are 181 construction grants either underway or pending in Kentucky for municipal wastewater control. Of these 181, 161 are Step I 's (evaluations), 9 Step II's (design) and 11 Step III's (construction). During the last year, there were 8 plants which were given final approval on completed construction. This completed construction improved approximately 20 miles of Kentucky streams. Table 4 is a summary of the grant status in Kentucky. Each river basin section contains a list of the facilities receiving grants.

Table 4

SUMMARY OF GRANTS TO MUNICIPALITIES IN KENTUCKY

	BASIN	Step I	Step II	Step III
A.	Mississippi	7	0	0
B.	Ohio	33	2	3
C.	Tennessee	5	0	0
D.	Lower Cumberland	7	0	1
E.	Upper Cumberland	21	1	0
F.	Green	27	0	1
G.	Salt	9	3	2
H.	Kentucky	30	1	2
I.	Licking	14	2	2
J.	Big Sandy	8	0	0
		161	9	11

NOTE: These are pending and projects underway.

Table 5 shows the municipal dollar needs estimated in 1974 by category in order that cities in Kentucky may meet water quality criteria and growth expectations.

Table 5

1974 NEEDS SURVEY

	1974 Needs Thousands Dollars
Category I Secondary Treatment	54,751
Category II Advanced Treatment	294,166
Category 111 A Inflow/Infiltration Correction	62,743
Category III B Major Sewer System Rehabilitation	84,181
Category IV A New Collectors	543,749
Category IV B New Interceptors	412,632
Category V Correction of Combine Sewer Overflows	706,559
Category VI Treatment and/or control of Stormwaters	2,052,631
Total Needs	4,211,412

The trace chemical water quality was compared to standards set by Kentucky in relation to health and public water supplies and to proposed Environmental Protection Agency standards. The waters which did not meet these standards are in areas of coal mining. The streams were Tradewater River, Olney (iron greater than 300 mg/l), and Pond River near Sacramento (flouride greater than 1.0 microgram/liter).

The Division of Water instituted bacteriological monitoring at selected public water supply treatment facilities in FY74. The data from this program is presented in the water quality data tables. Since the period of record is only two years, no concrete conclusions have been drawn from the data at this time. A preliminary cursory look at this data indicates that the coliform bacterial (Total and Fecal) are high in relation to the state criteria. A simple arithmetic mean of all total coliform data gives a result of 2,600 colonies per 100 ml statewide. This represents 644 observations of which 263 were greater than the standard or 41 percent exceedance (see Table 6).

When this recreational standard was exceeded or expected to be exceeded, a determination of fecal coliform was made (see Table 7). Table 7 shows that of 238 observations of fecal coliform, 90 were greater than 400 colonies per 100 ml. or 38 percent. The sixth annual report of the Council on Environmental Quality on page 361, Table 18 shows that 67 percent of the analyses for fecal coliform exceeded the recreation criterion. The arithmetic average of fecal coliform analyses in Kentucky was 85 colonies per 100 ml of stream water analyzed.

A copy of Kentucky's current regulation 401 KAR 5:025 is included here for your reference in comparing specific quality conditions reported to the current standards. These standards also appear in each data section of the river basin reports for each parameter reported.

Department for Natural Resources
and Environmental Protection
Bureau of Environmental Quality
Division of Water Quality

401 KAR 5:025. Water quality standards.

RELATES TO: KRS Chapter 224
PURSUANT TO: KRS 13.082, 224.033(17)
SUPERSEDES: WP-4-1
NECESSITY AND FUNCTION: This regulation is to implement KRS 224.020. The regulation provides narrative water quality standards for all waters and sets forth a use classification scheme with numeric criteria for applicable waters.

Section 1. Prohibitions. No person or group of persons as defined in KRS Chapter 224 shall cause to be violated any one of the minimum standards in Section 2 or any one of the standards established in Sections 3 to 9 of this regulation.

Section 2. The following are minimum conditions applicable to all waters of the Commonwealth of Kentucky. All waters of the Commonwealth shall be:

(1) Substantially free from substances attributable to municipal, industrial or other discharges or agricultural practices that will settle to form putrescet sludge deposits;

(2) Free from floating debris, oil, scum and other floating materials attibutable to municipal, industrial or other discharges or agricultural practices in amounts sufficient to be unsightly or deleterious;

(3) Free from materials attributable to municipal, industrial, or other discharges or agricultural practices producing color, odor or other conditions in such degree as to create a nuisance; and

(4) Free from substances attributable to municipal, industrial or other discharges or agricultural practices in concentrations or combinations which are toxic or harmful to human, animal, plant or aquatic life.

(5) In the standards established by subsections (1) to (4), every person as defined in KRS Chapter 224 shall remove from their discharges those substances described in subsections (1) through (4) to the lowest practicable level attainable under current technology.

Section 3. Stream use classification. In addition to the minimum conditions set forth in Section 2, the use classification found in Sections 4 to 9 shall fovern where applicable.

Section 4. Public water supply and food processing industries. The following criteria are applicable to surface water at the point at which water is withdrawn for use for a public water supply or by a food processing industry:

(1) Bacteria: Coliform group shall not exceed 5,000 per 100 ml as a monthly arithmetical average value as determined by either MPN or MF count nor exceed this number in more than twenty percent of the samples examined during any month; nor exceed 20,000 per 100 ml in more than five percent of such samples.

(2) Threshold-odor number after normal treatment shall not be less than three.

(3) Dissolved solids shall not exceed 500 mg/l as a monthly average value, nor exceed 750 mg/l at any time. Values of specific conductance of 800 and 1.200 micromhos/cm, at 25 degrees Centigrade, amy be considered equivalent to dissolved solids concentrations of 500 and 750 mg/l.

(4) Radioactive substances: Gross beta activity shall not exceed 1,000 picocuries per liter, pCi/l, nor shall activity from dissolved Strontium 90 exceed 10 pCi/l, nor shall activity from dissolved alpha emmitters exceed 3 pCi/l,

(5) Chemical constituants shall not exceed the following specified concentrations at any time:

Constituents	Concentrations, mg/l
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium (Hexavalent)	0.05
Cyanide	0.025
Fluoride	1.0
Lead	0.05
Selenium	0.01
Silver	0.05

Section 5. Industrial water supply. The following criteria are applicable to water at the point at which water is withdrawn for use, either with or without treatment, for industrial cooling and processing, other than food processing, and shall be applicable only within a mixing zone:

(1) pH shall not be less than 5.0 nor greater than 9.0 at any time.

(2) Temperature shall not exceed 95 degrees Fahrenheit at any time.

(3) Dissolved Solids shall not exceed 750 mg/l as a monthly average value, nor exceed 1,000 mg/l at any time. Values of specific conductance of 1,200 and 1,600 micromhos/cm, at 25 degrees Centigrade, may be considered equivalent to dissolved solids concentrations of 750 and 1,000 mg/l.

Section 6. Aquatic life. The following criteria are fo. evaluation of conditions for the maintenance of well balanced, indigenous fish population. The aquatic use standards shall not apply to areas immediately adjacent to outfall. Areas immediately adjacent to outfalls shall be as small as possible, be provided for mixing only, and shall not prevent the free passage of fish and drift organisms.

(1) Dissolved oxygen. Concentrations shall average at least 5.0 mg/l per calendar day and shall not be less than 4.0 mg/l at any time or any place outside the mixing zone.

(2) pH values shall not be less than 6.0 nor more than 9.0.

(3) Temperature shall not exceed 89 degrees Fahrenheit.

(a) There shall be no abnormal temperature changes that may effect aquatic life unless caused by natural conditions.

(b) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(c) The maximum temperature rise at any time or place above natural temperatures shall not exceed 5 degrees Fahrenheit in streams. In addition, the water temperature for all streams shall not exceed the maximum limits indicated in the following table:

Stream maximum temperature for each month in °F.

January	50
February	50
March	60
April	70
May	80
June	87
July	89
August	89
September	87
October	78
November	70
December	57

(d) The allowable temperature increase in public water impoundments shall be limited to 3 degrees Fahrenheit in the epilimnion if thermal stratification exists. Public water impoundments include all impounded water of the Commonwealth which are open to the public and used by the public.

(4) Toxic substances shall not exceed one-tenth of the 96-hour median tolerance limit of fish. Where there are substances that are toxic because of their cumulative characteristics, other limiting concentrations may be used in specific cases as presently approved by the Federal Environmental Protection Agency, or as later adopted by the Division of Water Quality.

Section 7. Put-and-take trout streams: The following criteria are applicable to those waters designated by the division as put-and-take trout streams:

(1) Dissolved oxygen concentrations shall not be less than 6.0 mg/l at any time or any place. Spawning areas, during the spawning season, shall be protected by a minumum DO concentration of 7.0 mg/l.

(2) Temperature: Stream temperatures shall not be increased artificially above the natural temperature at any time in cold water trout streams.

Section 8. Recreation: Unless caused by natural conditions, the following criterion shall apply in waters to be used for recreational purposes, including but not limited to such water-contact activities as swimming and water skiing. Bacteria: The total coliform level shall not exceed an average 1,000 per 100 ml. Total coliform shall not exceed this number in twenty percent of the samples in a month, nor exceed 2400/100 ml on any day. If the level of total coliform is exceeded, then a fecal coliform standard shall be used. There shall be a reduction of fecal coliform to such degree that during the months of May through October fecal coliform density in the discharge does not exceed 200 per 100 ml as a monthly geometric mean, based on not less than ten samples per month, nor exceed 400 per 100 ml in more than ten percent of the samples examined during a month, and not exceed 1,000 per 100 ml as a monthly geometric mean, based on not less than ten samples per month, nor exceed 2,000 per 100 ml in more than ten percent of the samples examined during a month.

Section 9. Agricultural: No criteria in addition to the minimum conditions enumerated in Section 2 are proposed for the evaluation of stream quality at the point at which water is withdrawn for agricultural and stock watering use.

Section 10. Multiple uses. One or more uses established in Sections 4 to 9 may apply to the same waters. The use criteria shall apply to those waters suitable for use or uses provided in Section 3. In the event there is a conflict between or among the applicable uses, the more stringent use criteria shall apply.

Table 6

TOTAL COLIFORM DATA FOR KENTUCKY

This data appears in the appropriate basin data summary.

Sta.	OBS	No.> 1,000	Colonies/100 ml. Average	Minimum	Max.	DATE Beg.	End.
2	21	15	6895	8	67000	750106	751218
3	8	8	7387	2000	15000	750219	751030
6	19	13	2795	10	10000	750106	751239
7	11	6	3345	648	18267	750130	751223
8	12	11	4306	217	11200	750107	751215
10	12	6	1854	0	4600	750107	751215
14	11	11	12968	1900	38000	750213	751111
16	14	0	159	0	745	750106	751204
17	14	0	87	0	560	750106	751204
18	10	2	681	80	3400	750211	751111
19	11	11	5909	1400	31000	750213	751111
20	12	1	476	41	1600	750121	751223
22	18	9	2240	3	14800	750106	751218
23	12	3	975	0	4167	750108	751218
24	13	0	182	0	800	750106	751204
27	12	0	262	5	800	750107	751217
28	12	4	1402	15	7400	750107	751215
29	11	1	211	0	1160	750107	751216
33	11	9	9160	0	31000	750212	751117
36	11	3	1605	98	7800	750107	751217
37	12	4	1147	0	7400	750107	751215
38	13	11	3581	786	10200	750107	751215
39	11	9	2081	233	6500	750107	751215
41	11	4	1335	0	6550	750108	751218
42	12	3	786	4	3300	750107	751217
43	11	0	87	0	400	750107	751216
45	11	4	1254	25	4700	750107	751216
46	6	3	2788	115	11000	750731	751217
47	12	0	310	16	933	750108	751215
49	21	18	9561	11	33750	750106	751219
50	19	13	7575	250	63600	750106	751218
51	18	10	3307	50	20800	750106	751218
52	18	10	2102	77	6700	750106	751219
53	20	13	5220	97	50400	750106	751219
54	13	0	251	0	482	750106	751204
56	13	0	210	0	484	750106	751204
57	12	0	14	0	60	750127	751204
58	13	0	190	26	800	750106	751204
59	14	0	196	0	500	750106	751204
60	14	0	169	0	488	750106	751204
61	12	1	302	10	2900	750130	751223
62	11	1	470	69	1600	750121	751223
63	11	1	409	0	1600	750121	751223
64	11	2	554	4	1600	750121	751223
65	12	1	322	0	1600	750121	751223
66	11	7	22193	32	190000	750130	751217
70	11	5	5278	100	28000	750130	751217
90	9	8	26826	800	140000	750226	751117
96	7	6	13681	10	65000	750219	751030
155	20	17	3992	10	16800	750106	751218

644 263

41 percent greater than 1,000 colonies/100 ml.

Table 7

Fecal coliform data for Kentucky.

This data appears in the appropriate basin data summary.

Sta.	OBS	No. > 400	Colonies/100 ml. Average	Minimum	Max.	DATE Beg.	End.
2	11	6	396	0	880	750218	751218
3	5	5	830	450	1220	750219	750730
6	12	6	1779	48	16100	750324	751239
7	7	1	384	83	2[illegible]	750530	751[illegible]
8	7	5	1514	192	6356	750421	751215
10	7	2	328	0	620	750421	751215
14	6	4	603	309	120[illegible]	750213	750[illegible]
16	4	0	58	3	140	750106	750216
17	4	0	12	1	23	750106	750216
18	4	0	90	0	300	750211	750[illegible]
19	6	3	635	160	1700	750213	750728
22	8	3	574	84	2100	750325	751218
23	3	1	511	0	1303	750722	751218
24	4	0	17	5	50	750106	750218
27	1	0	344	344	344	751022	751022
28	1	1	3780	3780	3780	751215	751215
33	7	4	770	50	1515	750212	750813
36	2	1	1553	73	3033	751022	751125
37	3	1	314	53	600	751022	751215
38	6	3	310	0	600	750519	751215
39	6	2	348	73	800	750721	751215
41	5	4	1558	139	3900	750624	751218
42	1	0	267	267	267	751022	751022
45	3	1	409	250	587	750722	751125
46	5	2	1622	200	6700	750826	751217
49	10	7	1291	56	3200	750417	751219
50	8	6	1296	137	3700	750507	751218
51	9	3	1249	4	8100	750324	751218
52	9	1	254	48	1100	750415	751219
53	9	3	1272	54	9533	750612	751219
54	4	0	39	4	104	750106	750218
56	3	0	5	0	11	750127	750218
57	4	0	34	0	126	750106	750218
58	5	0	50	1	160	750106	750512
59	4	0	29	8	67	750106	750218
60	4	0	27	11	65	750106	750218
62	1	0	49	49	49	750910	750910
63	1	0	70	70	70	750910	750910
64	1	0	96	96	96	750910	750910
66	9	5	3978	0	14000	750514	751217
70	8	1	945	0	6250	750515	751217
90	7	4	9965	20	50000	750212	751030
96	5	3	5256	0	24000	750219	750730
155	9	2	309	30	800	750507	751219
	238	90					

38 percent of all observations were greater than 400 colonies/per 100 ml.

Lakes Summary

This section represents that portion of the Water Quality Strategy in Kentucky which addresses lake water quality. It is intended as an extension of the Inventory of Lakes section in the Division of Water Quality 1974 Program Plan which is presented on the following page. The U.S. Army Corps of Engineers, as a participant in the coordinated water quality monitoring effort in Kentucky, has submitted water quality summaries for their fourteen major projects in the state. Table 1 presents a brief outline of the contents of these summaries. In addition, Table 2 presents a summary of water quality conditions at the fifteenth federal impoundment, Kentucky Lake, and a major private impoundment, Herrington Lake. The Kentucky Lake and Herrington Lake summaries were developed on the basis of limited water quality data obtained from the Tennessee Valley Authority and the Kentucky Department of Fish and Wildlife, respectively. On the basis of total area, the sixteen lakes summarized in this section represent 95 percent of the lake surface area in the state of Kentucky. Following the presentation of the Corps of Engineers lake reports is a glossary of general terms used within this section.

State of Kentucky

INVENTORY OF LAKES

	Federal USCE	S.C.S. State Municipal	Private
Total number of publicity owned fresh water lakes in the state	15	153	122
Total number of significant lakes			
Number of significant lakes exhibiting noticeable eutrophy			
Number of significant lakes exhibiting no noticeable eutrophy			
Number of significant lakes for which eutrophication status is not known E. G., data is not readily available to make a determination of its eutrophic status.			
Total area of publicly owned fresh water lakes	313,961	10,109	5,830
Total area of significant lakes			
Area of significant lakes exhibiting noticeable eutrophy			
Area of significant lakes exhibiting no noticeable eutrophy			
Area of significant lakes for which eutrophication status is not known.			

1. Federal-4 of 15 were a part of the National Eutrophication Survey none of the lake exhibited noticeable eutrophy.

2. Soil Conservation Service, State & Municipal — Most are used for public water supply, are small to moderate in size (20 to 850 acre) and the cities treat the lakes for algae control which precludes a judgment on the Eutrophic status.

3. Private (excludes Herrington Lake 2940 acres owned by Kentucky Utilities). Many lakes are for fee fishing, a few for water supply. Some lakes have public access and are developed with summer cottages. The fishing lakes would tend to a mesoeutrophic or eutrophic status because of artificial fertilization.

TABLE L-1a

WATER QUALITY SUMMARY OF THE MAJOR U. S. ARMY CORPS OF ENGINEERS PROJECTS IN KENTUCKY

PROJECT	CORPS DISTRICT	YEAR IMPOUNDED	THERMAL STRATIFICATION	DISSOLVED OXYGEN SUMMARY	MISCELLANEOUS PARAMETER SUMMARY
MARTINS FORK LAKE	NASHVILLE	Under Construction	Evaluation of water temperature data collected by U.S.G.S. will define the natural seasonal temperature regime.	Data base to be established after project completion.	Preimpoundment water quality data shows an increase in turbity levels and metals concentrations in Martins Fork.
LAUREL LAKE	NASHVILLE	1974	Typical of tributary type impoundment in the region.	Low hypolimnion dissolved oxygen, probably due to decay of organics in the recently impounded project. Trends in Hypolimnion dissolved oxygen to be monitored.	None Listed
LAKE CUMBERLAND	NASHVILLE	1950	Typical of tributary type impoundment in the region, however, all layers may not undergo complete mixing during winter.	Relatively low hypolimnion dissolved oxygen though not as severe as in similar projects.	Excessive turbidity in lower regions of lake.
DALE HOLLOW LAKE	NASHVILLE	1943	Typical of tributary type impoundment in the region.	Hypolimnion dissolved oxygen approaches zero near lake bottom in the fall.	None Listed
LAKE BARKLEY	NASHVILLE	1964	Does not stratify due to high current velocities in the upper reaches and low storage volume versus flow relationship.	Due to thermal stratification pattern, no significant dissolved oxygen problems exist, though isolated oxygen sags have been reported.	None Listed

TABLE L-1a
Continued

PROJECT	CORPS DISTRICT	YEAR IMPOUNDED	THERMAL STRATIFICATION	DISSOLVED OXYGEN SUMMARY	MISCELLANEOUS PARAMETER SUMMARY
CAVE RUN LAKE	LOUISVILLE	1973	Typical of tributary type impoundment in the region, having greatest impact on water quality in this lake.	Dissolved oxygen stratification develops with thermal stratification. Low hypolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Low dissolved phosphorus concentration.
NOLIN RIVER LAKE	LOUISVILLE	1963	Typical of tributary type of impoundment in the region, having greatest impact on water quality in this lake.	Dissolved oxygen stratification develops with thermal stratification. Low hypolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Moderated dissolved phosphorus concentration.
BARREN RIVER LAKE	LOUISVILLE	1964	Typical of tributary type of impoundment in the region.	Dissolved oxygen stratification develops with thermal stratification. Low hopolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Low dissolved phosphorus concentration.
BUCKHORN LAKE	LOUISVILLE	1960	Typical of tributary type of impoundment in the region, having greatest impact on water quality in this lake.	Dissolved oxygen stratification develops with thermal stratification. Low hopolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Low dissolved phosphorus concentration.
GREEN RIVER LAKE	LOUISVILLE	1969	Typical of tributary type impoundment in the region, having greatest impact on water quality in this lake.	Dissolved oxygen stratification develops with thermal stratification. Low hypolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Low dissolved phosphorus concentration.

TABLE L-1a
Continued

PROJECT	CORPS DISTRICT	YEAR IMPOUNDED	THERMAL STRATIFICATION	DISSOLVED OXYGEN SUMMARY	MISCELLANEOUS PARAMETER SUMMARY
ROUGH RIVER LAKE	LOUISVILLE	1959	Typical of tributary type impoundment in the region, having greatest impact on water quality in this lake.	Dissolved oxygen stratification develops with thermal stratification. Low hypolimnion dissolved oxygen near lake bottom.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Low dissolved phosphorus concentration.
DEWEY LAKE	HUNTINGTON	1950	Weak stratification during the summer.	Density layering effects cause the creation of secondary oxygen maxima in the dissolved oxygen distribution. Low hypolimnion dissolved oxygen at various levels.	Excessive levels of turbidity. High levels of iron and manganese correlating with high inflow leve Occasional high mercury concentrations.
FISHTRAP LAKE	HUNTINGTON	1968	Weak stratification during the summer.	Density layering effects cause the creation of secondary oxygen maxima in the dissolved oxygen distribution. Low hypolimnion dissolved oxygen at various levels.	Excessive levels of turbidity. High levels of iron and manganese correlating with high inflow leve Occasional high mercury levels in inflow and outflow.
GRAYSON LAKE	HUNTINGTON	1968	Typical of tributary type impoundment in the region.	Dissolved oxygen stratification develops with thermal stratification. Low hypolimnion dissolve oxygen near lake bottom. Outflow dissolved oxygen high due to high-level releases and stilling basin reaeration.	Excessive dissolved iron and manganese concentrations produced in oxygen depleted hypolimnion. Occasional high mercury levels. NOTE: Biological Survey Attached

TABLE L-1b

WATER QUALITY SUMMARY OF THE MAJOR U. S. ARMY CORPS OF ENGINEERS PROJECTS IN KENTUCKY

PROJECT	WATERSHED ACTIVITY	IMPACT OF WATERSHED ACTIVITY	PROJECT STATUS AND PLANS
MARTINS FORK LAKE	Coal Mining Project related relocation work.	Possible water quality degradation due to mining activities or project relocation work.	Future efforts include expanded sampling, installation of automatic monitoring system, and preparation of project operation manual.
LAUREL LAKE	Project power generation in Fall of 1976. Future tailwater trout fishery.	Tailwater trout stocking program may have to be delayed until a means is found to alleviate poor quality releases from oxygen depleted hypolimnion.	Future efforts include expanded sampling and studies to find a means to alleviate the problem of poor water quality releases.
LAKE CUMBERLAND	Project power releases Tailwater trout fishery	Release of turbid water in lower regions of the lake causes water in the tailwater and downstream points to appear murky.	Future efforts include a complete evaluation of all available water quality data, a better definition of inflow quality, a definition of withdrawal zone produced by power releases, and a study of reaeration by turbulence in the tailrace.
DALE HOLLOW LAKE	Coal Mining Project power releases Tailwater trout fishery	Low dissolved oxygen hypolimnetic releases create concern for tailwater trout fishery. Water quality degredation due to mining activities in the watershed particularly in the East Fork, Obey River drainage.	Future efforts include a complete evaluation of all available water quality data, a better definition of inflow quality, a definition of the withdrawal zone produced by power releases, and a study of reaeration by turbulence in the tailrace.
LAKE BARKLEY	Project power releases	No significant adverse impacts with the exception of isolated oxygen sags.	Future efforts include a study of the monitoring deficiencies and adjustment of strategy for monitoring.

TABLE L-1b
Continued

PROJECT	WATERSHED ACTIVITY	IMPACT OF WATERSHED ACTIVITY	PROJECT STATUS AND PLANS
CAVE RUN LAKE	Strip Mining Oil & Gas Wells Salyersville & West Liberty Sewage Treatment Plants	Minor water quality degradation due due to strip mining. No discernable effect from oil and gas wells in upper reaches. Negligible effect from sewage treatment plants. Problems created at Morehead Water Treatment Plant, 1 mile below dam due to poor quality releases.	Influent water quality rated as generally good, but showing some effects of strip mining. Future efforts include a study of feasible structural modifications to outlet works to eliminate releasing hypolimnetic waters.
NOLIN RIVER LAKE	Agriculture Elizabethtown & Hodgenville Sewage Treatment Plants. Tailwater Trout Fishery.	Minimal effect from sewage treatment plants. No nuisance algae blooms caused by relatively high nutrient levels produced by agricultural activity.	Influent water quality rated as relatively good.
BARREN RIVER LAKE	Oil Wells Glasgow Sewage Treatment Plant Tailwater trout fishery	No discernable effect from oil wells in upper reaches. Deleterious effects (low dissolved oxygen, algae blooms, odors, etc.) on Beaver Creek arm of lake caused by Glasgow Sewage Treatment Plant.	Influent water quality rated as generally acceptable with the exception of Beaver Creek.
BUCKHORN LAKE	Strip Mining Hyden Sewage Treatment Plant Tailwater trout fishery	Minor water quality degradation due to strip mining. Isolated algae blooms caused by occasional bypasses at Hyden Sewage Treatment Plant.	Influent water quality rated as acceptable, but altered somewhat from natural conditions by strip mining.

TABLE L-1b
Continued

PROJECT	WATERSHED ACTIVITY	IMPACT OF WATERSHED ACTIVITY	PROJECT STATUS AND PLANS
GREEN RIVER LAKE	Liberty Sewage Treatment Plant	Negligible effect from Liberty Sewage Treatment Plant.	Influent water quality rated as excellent, having been only slightly altered from natural conditions.
	Tailwater Trout Fishery		
ROUGH RIVER LAKE	Agriculture	No nuisance algae blooms caused by nutrients produced by agricultural activity.	Influent water quality rated as relatively good.
	Tailwater Trout Fishery		
	Leitchfield Municipal Water intake.	Problem at Leitchfield Water Plant alleviated by switching from deepest intake to shallowest intake during stratification.	
DEWEY LAKE	Coal Mining	Degradation of water quality due to coal mining, resulting in excessive sedimentation and metals concentrations with possibility of adverse effects on the pH regime in the near future.	Lake water quality rated as poor to degraded.
		Severe hydrogen sulfide odors in stilling basin produced in the oxygen depleted hypolimnion.	Future efforts include intensified monitoring of the effects of coal mining, and monitoring of mercury concentration.
FISHTRAP LAKE	Coal Mining	Degradation of water quality due to coal mining, resulting in excessive sedimentation and metals concentrations with possibility of adverse effects on the pH regime in the near future.	Lake water quality rated as degraded to severely degraded
	Tailwater Trout Fishery		Future efforts include intensified monitoring of the effects of coal mining.
GRAYSON LAKE	Coal Mining	No significant adverse impact on water quality by mining activities at this time.	Lake water quality rated as fair to good.
	Tailwater Trout Fishery		Future efforts include monitoring programs focused at both inflow and lake stations, and cooperative studies and regulatory effort with the State of Kentucky and other appropriate agencies.

TABLE L-2a

WATER QUALITY OF OTHER MAJOR LAKES IN KENTUCKY

IMPOUNDMENT	GOVERNING AGENCY	YEAR IMPOUNDED	THERMAL STRATIFICATION	DISSOLVED OXYGEN SUMMARY	MISCELLANEOUS PARAMETER SUMMARY
KENTUCKY LAKE	TENNESSEE VALLEY AUTHORITY	1944	Pattern similar to Barkley Lake. Some period of weak stratification.	Due to thermal stratification pattern, no significant dissloved oxygen problems exist	No excessive concentrations of trace elements with the exception of ocasional high levels of manganese.
HERRINGTON LAKE	KENTUCKY UTILITIES	1925	Typical of tributary type impoundment in the region.	Density layering effects cause the creation of secondary oxygen maxima in the dissolved oxygen distribution. Low hypolimnion dissolved oxygen at various levels.	Ranges of pH and alkalinity indicative of high buffering capacity of watershed. Occasional hydrogen sulfide odors occurring in low dissolved oxygen level of primary oxycline.

TABLE L-2b

WATER QUALITY OF OTHER MAJOR LAKES IN KENTUCKY

IMPOUNDMENT	WATERSHED ACTIVITY	IMPACT OF WATERSHED ACTIVITY	PROJECT STATUS AND PLANS
KENTUCKY LAKE	Project Power generation Phosphate mining on Duck River.	No significant adverse impacts on water quality by phosphate mining on Duck River or other activities in upper reaches.	Lake water quality rated as excellent. Future efforts include continued monitoring by Tennessee Valley Authority and related agencies.
HERRINGTON LAKE	Project Power Generation.	No significant adverse impacts on water quality at this time.	Future efforts include expanded monitoring in order to broaden the data base.

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Data for this report was assembled from the following sources:

United States Geological Survey water quality data as retrieved through the "STORET" information system.

"Water Resources Data for Kentucky, Water Year 1975", U. S. Geological Survey Water-Data Report KY-75-1.

United States Army Corps of Engineers, Huntington District, Louisville District, and Nashville District

United States Department of Agriculture, Soil Conservation Service, Lexington, Kentucky.

Kentucky Department of Fish & Wildlife Resources.

Kentucky Department for Natural Resources and Environmental Protection, Division of Water Quality

Ohio River Valley Sanitation Commission, Cincinnati, Ohio.